Hemihalictus lustrans (Ckll., 1897).

Hab. Las Vegas, July 18, at flowers of Pyrrhopappus, $4 \$? (A. Garlick).

Phileremulus nanus, Ckll., 1895.

Hab. Las Vegas, Aug. 7, about a patch of Chamæsaracha coronopus, $1 \notin (Ckll.)$.

Perdita chamæsarachæ, Ckll., 1896.

Hab. Las Vegas, Aug. 7, at flowers of Chamæsaracha coronopus, $1 \not\in 1, 1 \notin (Ckll)$.

Mesilla Park, New Mexico, U.S.A., Feb. 18, 1900.

LV.—On a new Ostracoderm (Euphanerops longævus) from the Upper Devonian of Scaumenac Bay, Province of Quebec, Canada. By A. SMITH WOODWARD, LL.D., F.L.S.

[Plate X. figs. 1, 1 a, 1 b.]

DR. TRAQUAIR'S recent memoir on new Silurian fishes from Scotland * suggests the correct interpretation of a problematical fish from the Upper Devonian of Canada which has been for some years in the collection of the British Museum. This specimen was obtained by Mr. Jex from the well-known fish-beds of Scaumenac Bay, in the Province of Quebec, associated with species of *Bothriolepis*, *Diplacanthus*, *Coccosteus*, *Scaumenacia*, *Glyptolepis*, *Eusthenopteron*, and *Cheirolepis*, which have been described by Whiteaves †, Traquair ‡, and myself §. It is preserved in the counterpart halves of a nodule, and the two sides are shown of the natural size in Pl. X. figs. 1, 1 a.

As indicated by the best side of the fossil (fig. 1), the anterior half of the fish is distorted and its precise contour is destroyed, while the caudal region is well preserved in direct

^{*} Trans. Roy. Soc. Edinb. vol. xxxix. no. 32 (Dec. 1899).

⁺ J. F. Whiteaves, Trans. Roy. Soc. Canada, vol. iv. (1887) sect. iv. p. 101, and *ibid.* vol. vi. (1888) sect. iv. p. 77.

¹ t R. H. Traquair, Geol. Mag. [3] vol. vii. (1890) p. 307, and *ibid.* vol. x. (1893) p. 262.

[§] A. S. Woodward, Geol. Mag. [3] vol. ix. (1892) p. 482.

side-view. The dermo-skeletal covering of the head must have been very slight, for its border cannot be distinguished with certainty. It seems to have consisted merely of small shagreen-like granules, which are not fused into plates. The only clearly distinguishable feature is a pair of small thickened skeletal rings (o.), which may probably be interpreted as orbits, but are somewhat further apart than in *Cephalaspis*. The shagreen-like granules are seen within each supposed orbit; but this may be the result of accidental displacement or the crushing of the dorsal shield upon the ventral covering. When viewed in some lights other appearances suggest that more structure might be observable in a better preserved specimen; but a slightly fibrous longitudinal streak apparently beneath the outer granules, extending backwards from the left orbit-like ring, is the only other noteworthy feature.

The abdominal region is probably deepened by the distortion of its dorsal portion, while its dermal covering is nearly as obscure as that of the head. It seems, however, to have been armoured with small, narrow, and deep scales, arranged in straight rows, which incline slightly forwards and downwards instead of backwards and downwards, as is usually the arrangement in fishes. At the anterior end of the ventral border there are obscure traces of two or three slightly larger scales, which may have been placed on the median ventral ridge. The less complete side of the fossil (Pl. X. fig. 1 a) shows not only the peculiar squamation, but also certain rodlike remains near the dorsal border of the abdominal region, which are suggestive of calcified neural spines of an endoskeletal axis. The latter structures, however, are not quite clear.

There are no traces of paired fins or their supports.

The slender caudal region is well shown in direct side-view on both halves of the fossil, and terminates in a heterocercal It is completely covered with scales like those of the tail. abdominal region, similarly disposed in straight oblique series inclined forwards and downwards. The scales seem to be rather thick, scarcely if at all overlapping, invested with enamel and marked with a few antero-posteriorly-directed ridges and grooves. One from the middle of the flank is represented diagrammatically of ten times the natural size in fig. 1 b. The scales on the sides of the upper caudal lobe seem to be nearly quadrilateral, while its dorsal border is fringed with a single (possibly paired) series of very slender ridge-scales. There is a small remote dorsal fin (d.), low and triangular, apparently stiffened by scales like those of the Ann. S. Mag. N. Hist. Ser. 7. Vol. v. 27

trunk, but smaller, arranged in rows to simulate fin-rays. The large caudal fin (c.), which is slightly excavated behind, is invested with small shagreen-like granules, but also seems to have been stiffened with some stout deeper rays, which are conspicuous through this covering (fig. 1 a). Within the lobe at the base of the caudal fin, especially on the side shown in fig. 1 a, there are also traces of hour-glass-shaped calcified harmal supports.

On the matrix of the fossil, both above and below the caudal region, there are slight brownish streaks continuing the lines of the squamation. These are doubtless merely mineral stains, produced by the circumstances of fossilization.

Judging by the results of Dr. Traquair's recent researches. to which reference has been made, the fossil now described represents a fish-shaped organism related to Cephalaspis, but distinguished from that and all known allied genera by the absence of a continuous head-shield. Dr. Traquair has already shown that the dermal plates both of the Pteraspidians and of the Cephalaspidians developed originally by the fusion of shagreen granules. The shield now described in the Canadian fossil is therefore of the most primitive nature, apparently only modified by the development of a solid rim round each orbit. For this reason the specimen is of great interest, because it shows that one of the earliest types of Ostracoderm armour survived until the latter part of the Devonian period. It has even further importance as being the first example of an Ostracoderm in which traces of the axial skeleton of the trunk have been detected.

No fragments of armour resembling that displayed by this fossil appear to have been hitherto described. The animal must thus be placed in a new genus, Euphanerops, defined by the presence of the stout orbital rims, the regular squamation of small deepened scales, the slenderness of the caudal ridge-scales, and the apparent absence of other well-developed ridge-scales. The species may be named longaevus and characterized by the proportions of the caudal region and the nature of the scale-ornament. The family of Euphaneropidæ, of which this is the first known genus and species, must be referred either to the Osteostraci or to the Anaspida. It is distinguished from the Ateleaspidæ, Cephalaspidæ, and Tremataspidæ by the non-fusion of the tubercles forming the head-shield. It almost certainly differs from the Birkeniidæ in the absence of a lateral row of perforations at the hinder end of the branchial chamber, though the actual branchial opening has not yet been seen.

EXPLANATION OF PLATE X. FIGS. 1, 1a, 1b.

Fig. 1. Euphanerops longævus, gen. et sp. n.; the more complete side of the fossit and its connterpart (1 a), nat. size, with scale (1 b) enlarged ten times. — Upper Devonian; Scaumenac Bay, Province of Quebec, Canada. [British Museum.]

c., caudal fin ; d., dorsal fin ; o., orbits.

LVI.—On a new Species of Deltodus from the Lower Carboniferous (Yoredale Rocks) of Yorkshire. By A. SMITH WOODWARD, LL.D., F.L.S.

[Plate X, figs. 2, 2 a, 2 b.]

The dental plates of some of the Palaeozoic Cochliddont sharks attain a considerable size, but those referable to the genus *Deltodus*, as defined in the British Museum Catalogue, have not hitherto been remarkable in this respect. A new specimen, presented to the British Museum by the Rev. Addison Crofton, M.A., is therefore of much interest as showing that at least one species of *Deltodus* rivalled the largest species of some allied genera in size. This fossil was discovered by the donor in a dark-coloured limestone of the Yoredale Series on Blackthorn Farm, between Long Preston and Slaidburn, North Yorkshire. It is shown of three quarters the natural size from the oral and attached faces and from the hinder aspect in Pl. X. figs. 2, 2 a, 2 b.

This dental plate is much inrolled at the attenuated outer margin; it is thus of the form commonly assumed to belong to the lower jaw. If it be truly lower, it is the hinder dental plate of the left mandibular ramus. Its curvature is not directly at right angles to the long axis of the ramus, but very oblique, so that the antero-lateral margin (a.) is much longer than the postero-lateral margin (p.). Its outer inrolled portion is obscured by the matrix, but the inner margin (i.) is well preserved and seen to be gently sinnous. Its maximum transverse measurement at the inner margin is 0.06 m. The coronal surface is only gently convex and the small hinder wing of the plate is not sharply defined by any depression or flattening. The upper functional portion is crossed by eight or nine rounded and sinnous furrows, between each two of which the crown is slightly raised into a

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